

PV DESIGN WORKSHEET WITH MICRO INVERTERS

Based on the 2013 CEC

PROJECT ADDRESS: _____ PLAN CHECK# _____

Breaker maximum sizes: #14 – 15A, #12 – 20A, #10 – 30A, #8 – 50A, #6 – 60 A, #4 – 80A

Voc _____ Isc _____

Table 310.15 (B) 16 (See Art. 110.14 C)

1. MAX PV VOLTAGE AND CURRENT CALCULATIONS:

Wire Size Max Ampacity

14 25

a. Max PV system voltage (per NEC. 690.7): **12** **30**

Check voltage rating in Micro inverter specs. Should be **240 V** **10** **40**

8 **55**

!!! Sec. 690.7C requires the Max PV voltage to be **6** **75**

Less than 600 volts

*1 voltage correction factor section 690.7

b. Max PV current (NEC 690.7) 1.12 X max output ampacity of micro Inv. X # of micro Inverters.

So, 1.12 x _____ x _____ = _____ amps

2. AC CONDUCTOR AMPACITY CALCULATIONS: (array to combiner box) NEC310.15

a. Expected wire temp. = _____ (See Rule K. then use table 310.15 (B) (2) (a))

b. Temp. correction = .58 (refer to table 310.15 (B) (2) (a)).

c. # of current carrying conductors = _____

d. Conduit fill de-rating: .80 (for more than 3 conductors per table 310.15(B)(3)(a)) If 3 or less: use "1"

e. Circuit conductor size: _____ awg

f. Circuit conductor ampacity (310.15(B)(16)): _____ amps

g. Required Circuit conductor ampacity per NEC 690.8 A info note.

1.25 x M.I. output x # of M.I.'s = _____ amps

1.25 x _____ X _____ = _____ amps

h. Derated ampacity of circuit conductor per CEC 310.15 (B) (2) (a)

Temp. corr. (refer to table 310.15 (B) (2) (a)). x conduit fill corr. (per table 310.15(B)(3)(a)) x

circuit conductor ampacity (CEC 310.15 (B) (16)) = _____ amps

.58 x _____ x _____ = _____ amps

Note: H must be larger than G Yes ___ No ___ (check one)

3. AC CONDUCTOR AMPACITY CALCULATIONS (*from combiner box to main panel OR j-box to main panel*)

- a. Ambient temp. adjustment, expose conduit (CEC 310.15 (B) (2) (a) + 22 degrees
Expected wire temp. (C deg.) (CEC table 310.15 (B) (2) (a)): 41 deg. + 22 deg. = 63 deg.
Temp. correction per table 310.15 (B) (2) (a): .58
or current carrying conductors: _____
Conduit fill correction (NEC 310.15B.3.a) _____ .80 (for more than 3 conductors per table 310.15(B)(2)(a)) If 3 or less: use "1"
Circuit conductor size: _____ awg
Circuit conductor ampacity: _____ amps
- b. Required circuit conductor ampacity (NEC 690.8 A info note)
1.25 x M.I. max output X # of M. I.'s in parallel
1.25 x _____ x _____ x _____ = _____ amps
- c. Derated ampacity of circuit conductor (NEC 310.15 B 2 a)
Temp. correction (NEC table 310.16) x conduit fill correction (NEC 310.15B.2.a) x circuit conductor ampacity = _____ amps
.87 x _____ x _____ = _____ amps

Note: C must be larger than B Yes___ No ___(check one)

RULES:

- A. AC BREAKER: to be no more than the next standard breaker size up from (calculation 4B).
- B. Bus Rating: Article 705.12D(2) states that the sum of the ampere ratings of the overcurrent devices in circuits supplying power to a busbar or conductor shall not exceed 120% of the rating of the busbar or conductor.
- C. Maximum of 18 inches can cantilever beyond the standoff connection
- D. AC BREAKER: to be rated to protect the conductor per table 310.16 and Art 240.4.D/240.6.A-
- E. CONDUIT(S) SHALL BE PAINTED TO MATCH SURFACE AND SHALL BE INSTALLED MORE THAN ½"(INCHES) ABOVE ROOF SURFACE
- F. ALL EQUIPMENT TO BE LISTED FOR THE PURPOSE.
- G. Provide SOLAR PANEL COPPER LAY-IN GROUNDING LUG, TIN PLATED, 14-4, STAINLESS STEEL SCREW, SUITABLE FOR DIRECT BURIAL
- H. Use #8 bond wire from Service panel to rooftop, then #6 on rooftop where exposed. (NEC 250.120).
- I. Prior to the installation of the solar panels, the Contractor shall schedule an anchorage inspection for all standoffs.
- J. **SMOKE DETECTORS SHALL BE INSTALLED:**
- a- Centrally located in corridor (or area) leading to sleeping areas, and inside each sleeping room.
- b On ceiling of upper level in close proximity to the stairway when sleeping areas are on an upper level.
- c On each floor level and in basement.

- d In the adjacent room (or area) where the ceiling height exceeds that of the hallway by 24" or more.
- e Battery operated smoke detector permitted in existing construction.

CARBON MONOXIDE SHALL BE INSTALLED:

- a. Outside of each separate dwelling unit sleeping area in the immediate vicinity of the bedroom(s).
 - b. On every level of a dwelling unit including basements.
 - c. Battery operated carbon monoxide detector permitted in existing construction.
- K. The ASHRAE (90.1) 2% Temperature should be used for all starting ambient temperatures. This is the temperature that is likely exceeded during 14 hours (not necessarily continuous) over a summer month (June through August). The rooftop temperatures for conduit are then adjusted for rooftop conditions. So in Ontario the 2% temperature is 37°C or 98.6°F. NEC table 310.15(B)(3)(c) then shows us we need to add 22°C or 40°F to conduit that is placed ½" to 3-1/2" above the roof surface. The rooftop temperature measurement then becomes 59°C or 138.2°F.

Definitions:

Combiner box: used where long runs of wire occur in order to reduce cost of installing many smaller wires.

Junction box: used to change type of wire from "roof cable" to THWN-2